Before the
Federal Communications Commission
Washington, D.C. 20554

In the Matter of	)	
	)	
Facilitating the Deployment of	)	PS Docket No. 11-153
Text-to-9-1-1 and Other Next	)	
Generation 9-1-1 Applications	)	
	)	
	)	
Framework for Next Generation	)	PS Docket No. 10-255
9-1-1 Deployment	)	

COMMENTS OF
NORTHROP GRUMMAN SYSTEMS CORPORATION

NORTHROP GRUMMAN
SYSTEMS CORPORATION

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EXECUTIVE SUMMARY

Legacy 9-1-1 systems are based on analog switched telephone technology and cannot handle text, images, and video, which are increasingly common in personal communications and vehicle based safety services. As these alternative forms of communication become commonplace amongst the general public, there is an expectation that they can be used to request emergency services. Further, these forms of communication can provide richer information about emergencies to telecommunicators enabling increased situational awareness and a more effective response. In an increasingly interconnected world faced with more complex threats, the need for sharing information across jurisdictional boundaries and international borders is paramount. A highly standardized and secure system is essential and critical to seamlessly support communications and data transfer across county, state, and international borders, and across the multitude of emergency response agencies, from traditional Public Safety Answering Points (PSAPs) to fusion centers, trauma centers, Coast Guard, and disaster management centers.

Northrop Grumman is a dedicated and proud partner in protecting this nation's critical infrastructure. For fifty years, we have supported our nation's first responders with technologies and solutions that help them perform their vital roles. Our public safety and homeland security solutions rely heavily on information quality, accuracy, and availability. As the citizen's access point to emergency services, 9-1-1 provides the initial source of emergency related information, enhancing that information with text messages, pictures, video and other related data gives responders further advantage in mitigating emergency situations. Therefore, Northrop Grumman is a stakeholder, along with our customers, in the development and adoption of Next Generation 9-1-1 (NG9-1-1) functionality.

We fully support the Commission's efforts in this regard. Therefore, this document serves as Northrop Grumman's comments relative to the Notice of Proposed Rulemaking: "Facilitating the Deployment of Text-to-9-1-1 and Other Next Generation 9-1-1 Applications" and "Framework for Next Generation 9-1-1 Deployment."

Within this document, we discuss a variety of topics relative to the implementation of NG9-1-1, largely focusing on text messaging, including technical, operational, and cultural issues. We will also discuss multimedia data sources. The technical discussion involves the type and form of messaging such as SMS and MMS, and the platforms required to support them.

Other technical issues include message latency, network capacity, and quality of service when networks become congested. Operational issues involve telecommunicator work load and prioritization of messages by the receiver. Significant discussion will be invested in security issues and the threat to the network by opening it up to the outside world. Finally, we explore the cultural aspects of NG9-1-1 data. As anyone with a teenager knows, text messaging has evolved into a "foreign language." The effort to train and keep telecommunicators up to date will be significant.

We hope that by combining these comments with those of our expert colleagues in the public safety communications and information technologies community, deployment of a standards based national NG9-1-1 functionality will be achieved. As a result, emergency response and preparedness will be enhanced, communities will be more secure, and the safety of our first responders will improve.

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Northrop Grumman Systems Corporation ("Northrop Grumman")[1] hereby submits its Comments in response to the *Notice of Proposed Rulemaking*[2] in the above-captioned proceeding, wherein the Commission is seeking to accelerate the development and deployment of Next Generation 9-1-1 (NG9-1-1) technologies that will allow the public to interact with emergency services using new and emerging forms of communications such as text, video, and data, beyond the customary voice mode of legacy 9-1-1 communications. Northrop Grumman supports the FCC's involvement in encouraging the transformation of 9-1-1 systems towards a modern, secure, and reliable Internet Protocol based communications system that can handle the next generation, data-centric communication technologies including broadband wireless while continuing to provide reliable voice-based 9-1-1 services.

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[1] Northrop Grumman Information Systems, Inc., a wholly-owned subsidiary of Northrop Grumman Corporation, is a leading provider of IT, systems engineering and systems integration for the Department of Defense, national intelligence, federal civilian, state, and local agencies, and commercial customers. Northrop Grumman is a leader in public safety systems and one of the world's largest suppliers of 9-1-1 First Responder Computer-Aided Dispatch systems, as well as a major presence in homeland security initiatives as the number one provider of security solutions to the federal government. Northrop Grumman deploys next-generation secure broadband wireless networks and interoperable voice communications solutions for defense, intelligence, and public safety organizations, and has deployed the first large-scale secure mission-critical broadband wireless system for the public sector, covering the entire City of New York and serving a wide range of different public safety and government operations and entities. Northrop Grumman also supports the IT enterprise of the Commonwealth of Virginia and the City of Indianapolis.

[2] Notice of Proposed Rulemaking: Facilitating the Deployment of Text-to-9-1-1 and Other Next Generation 9-1-1 Applications, PS Docket No. 11-153 and Framework for Next Generation 9-1-1 Deployment, PS Docket No. 10-255, et.al., released October 12, 2011.

Northrop Grumman concurs with the Commission's view that NG9-1-1 capabilities will significantly enhance the quality of information available to first responders and Public Safety Answering Points (PSAPs) thereby improving the effectiveness and timeliness of emergency response. These capabilities will also benefit the public by making emergency services more accessible to people including those with disabilities. However, it is Northrop Grumman's view that simply equipping the PSAP with technologies to accept new forms of communications such as text and video is only an important first step towards building a comprehensive NG9-1-1 system. In addition to non-voice communications capabilities, a comprehensive, mature and fully functional NG9-1-1 system will also need to include:

- technologies and standards for information analytics, a term typically used for synthesizing and analyzing information from multiple sources to improve situational awareness – a key objective of the NG9-1-1 systems, and
- processes, policies and procedures for protecting the NG9-1-1 network from cyber threats, given that the NG9-1-1 systems will rely on ubiquitous and standardized but attack-prone Internet Protocol (IP) based technologies and network interfaces for communications.

Northrop Grumman has concentrated its responses in particular areas of expertise where there is an intersection of its considerable experience in providing mission-critical services to public safety and specific areas of challenges in transforming the current 9-1-1 infrastructure to NG9-1-1 systems. Drawing from our extensive experience in providing computer aided dispatch systems and building, operating, and managing emergency call centers for public safety we have focused our response to technical and operational challenges associated with managing, storing, analyzing, and protecting the data received at the PSAPs from a variety of text and multi-media based messaging systems. Text and multi-media messaging systems have gained widespread acceptance as a means of communications in recent years mainly due to the proliferation of wireless data networks and mobile devices equipped with text and multi-media messaging capabilities.

Northrop Grumman has made significant investments in solutions and services that help the first responder community save lives, protect infrastructure, and maintain a safe and peaceful homeland. Therefore, we are pleased to comment on issues of interest to the Commission as requested.

I.   INTRODUCTION

Northrop Grumman Information Systems, Inc. is a wholly-owned subsidiary of Northrop Grumman Systems Corporation. As a leading provider of IT, systems engineering and systems integration, we serve the Department of Defense, national intelligence, federal civilian and state agencies, local government agencies, and commercial customers. Northrop Grumman has a long and strong history as a trusted partner of public safety, providing innovative systems and solutions to our Nation's state and local public safety organizations. Northrop Grumman provides large-scale Computer-Aided Dispatch (CAD) systems that serve some of the largest cities in the US, including New York, Los Angeles, Chicago, Houston, Phoenix, and Philadelphia. For more than 50 years, Northrop Grumman has assisted the public sector in building and operating IT systems that support critical missions to deliver services and protect citizens. Northrop Grumman provides unbiased engineering and vendor-neutral integration embracing best-of-class technologies and products which deploy and manage a wide range of networks.

As the Commission and the public safety community prepares to transition their legacy 9-1-1 systems to the next generation of communications technologies and systems that will more efficiently and effectively save lives and protect property, Northrop Grumman stands ready to assist the Commission and public safety in dealing with the complexity of the technology and overcoming challenges associated with architecting, designing, implementing, and operating the NG9-1-1 network.

The explosive growth in the use of high speed Internet and broadband wireless data networks has fueled the development of many new forms of communication technologies, such as text messaging and Voice over Internet Protocol (VoIP), beyond that experienced with traditional voice calls. People are now able to make calls and send and receive data such as texts, pictures, and video to each other while at home or on the move from a wide range of devices and locations. The growing market penetration of both wireless and VoIP telephony and the new trends in communications involving the convergence of Internet, broadband data, and wireless mobility have highlighted the limitations of the existing voice-centric 9-1-1 infrastructure.

The current 9-1-1 system, based on old analog, voice-centric telephone technology cannot handle the text, images, and video, increasingly common in personal communications and vehicle based safety services. In addition, in an increasingly interconnected world, the need for sharing information across states, between states, and across international boundaries is paramount. A highly standardized and secure system is essential and critical to seamlessly support communications and data transfer across county, state, and international borders, and across the multitude of emergency response disciplines and agencies, from traditional PSAPs to Poison Control Centers, trauma centers, Coast Guard, National Guard, and disaster management centers. In that regard, Northrop Grumman endorses the Commission's efforts in reaching out to industry stakeholders via this NPRM to provide meaningful input on various issues of interest associated with NG9-1-1.

Northrop Grumman recognizes that within the NG9-1-1 System, the mission of PSAPs essentially remains the same:

- to receive emergency calls from the public;
- ascertain the nature, status, and location of the emergency; and
- to dispatch the responders directly or relay the call to the appropriate secondary public safety answering center.

While NG9-1-1 does not change the fundamental mission of PSAPs, it changes the core definitions of emergency services in two major areas (1) the types of calls received and (2) the ability to receive voice, text, images, video, and data. This enhanced information can also come from other PSAPs or services outside the local region as NG9-1-1 must have the ability to transfer or exchange voice and data with other PSAPs and dispatch centers, as well as to state or federal entities involved.

While the technical aspects of incorporating and integrating NG9-1-1 technologies in the PSAPS to handle different mediums of communication securely and reliably may be complex, it is our view that operational aspects of managing the information flow are equally critical. As information is received via different communications media in different formats, it needs to be disseminated to the right stakeholders in a timely manner. We urge the Commission to pay close attention to the operational aspects of NG9-1-1 as it evaluates information on various technology options and considerations for the NG9-1-1 systems.

In the following Sections we provide our comments on the technical, operational, and cultural considerations of NG9-1-1 functionality. Technical considerations addressing the IP versus switch-based architecture are addressed. This includes the technology platform for SMS (Short Message Service) and MMS (Multimedia Message Service) messaging, prioritization, quality of service, and the foundation for a standards-based framework. Operational challenges include information analytics and security. Finally, the cultural implications of NG9-1-1 involve texting as a "foreign language" and managing the expectations of NG9-1-1 value in the call for service process.

II.   **TECHNICAL CONSIDERATIONS**

The major technical issues that need to be considered to account for the IP-based architecture of NG9-1-1 rather than the circuit switched architecture of legacy 9-1-1 systems are listed as follows:

- Upgrading the network interfaces at the PSAPs to handle new modes of communications such as video and text messaging. The PSAPs will also need mechanisms to recognize the call origination platform that will enable caller identification and location information extraction.

- The PSAPs will require the capability to determine the callers' identity based on identifiers such as email addresses, Session Initiation Protocol (SIP)[3], and Uniform Resource Locators (URLs)[4] handlers

- The technology platforms used for communications within the NG9-1-1 systems

- Quality of Service and prioritization of SMS and MMS messages

- Standards framework for implementing SMS and MMS

- Security of file attachments

In the following discussion, we provide our views on technical considerations related to quality of service and standards framework SMS and MMS for NG9-1-1.

Text Messaging refers to the exchange of short messages between fixed-line or wireless devices over a communications network. Text messaging started out initially as a SMS, but has

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[3] Session Initiation Protocol is application-layer control protocol that can establish modify, and terminate multimedia sessions (conferences) such as Internet telephony calls – Network Working Group RFC 3261
[4] Uniform Resource Locators provide a standardized way to locate resources on an IP network such as the Internet

now expanded to include multimedia messaging that carries attachments such as still pictures, video, and audio. Text messaging is often used between mobile device users as an alternative to voice calls especially when the voice conversation is undesirable.

With the evolution of mobile devices such as smartphones and increased growth in mobile subscribers, text messaging has become an increasingly important form of communications. Industry statistics has shown that texting rose 450% over phone calls in the past couple of years with widespread prevalence among the younger demographics. Thus, the widespread acceptance and adoption of SMS and MMS by wireless subscribers of all ages and their inclination for non-voice based communications provides the right platform on which to build NG9-1-1 capabilities. These NG9-1-1 capabilities will increase the rate of reporting emergencies and help PSAPs in coordinating and expediting the dispatch of first responders for effective and efficient response to emergencies.

SMS is the simplest and most common type of text message and is supported by a large number of mobile phones. SMS typically allows for text messages with a maximum of 160 characters per message.

MMS is an extension of an SMS text, that can also include multimedia elements such as pictures, videos, audio files, and text pages sent from a mobile device. Both SMS and MMS are designed to be brief sets of information delivered over shared, cost-efficient resources on the wireless network.

Technology Platforms for SMS and MMS

Short message service is a mechanism of delivery of short messages over circuit-switched mobile networks. It is a store and forward way of transmitting messages to and from mobiles. The message (text only) from the sending device is stored in a central short message center (SMC)[5] which then forwards it to the destination mobile using the signaling (control) channels. In some configurations of SMC, the messages are re-transmitted if they failed in the first instance. The information is 'immediately' received by a device even if a voice or data call is on-going.

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[5] Short Message Center is a network entity that stores and forwards text based messages to and from a mobile device

SMS is a first generation 3GPP and 3GPP2 (GSM and CDMA)[6] service that had some inherent limitations including the relatively short messages size (not exceeding 160 characters-though some mobile phones allow the creation of "concatenated messages" which can extend the maximum number of characters). There is also the issue of text input mechanisms in mobile devices that makes it very uncomfortable sending longer messages especially on simple devices (with no QWERTY capability). However, predictive text input algorithms implemented in mobile devices as well as voice-to-text recognition systems can help ameliorate these limitations.

MMS is an evolution of SMS that allows a combination of text, sounds, images, and video. MMS messages are sent to the Multimedia Messaging Service Center (MMSC)[7]. They are then sent to the recipient via the internet, if the phone supports MMS formats. If it doesn't, the MMS can be viewed in a web browser. It uses standardized protocols and can run on any bearer service on current 3G and 4G[8] technology platforms. As opposed to SMS, MMS needs a dedicated channel. It would also require new network elements like Multimedia Messaging Relays, MMS Server, and MMS User Databases.

Although MMS is the newest and feature rich standard of messaging, its implementation dependent and carries with it the potential of incompatibility between phone manufacturers and even between mobile carriers. Consequently, there could be "interoperability" issues between different mobile carriers and between mobile phone models, hence its realization and use by PSAPs.

Northrop Grumman encourages the adoption of SIP based protocol in the proposed architecture and recommends that low-latency and jitter-less mechanisms that ensure guaranteed message delivery (with acknowledgement capability) be incorporated into the architectural framework.

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[6] GSM – Global System for Mobile communications is a term used for a family of mobile wireless standards defined by the 3GPP. CDMA – Code Division Multiple Access refers to a family of wireless standards based on a different technology than GSM and developed by 3GPP2 standards body.

[7] Multi Media Messaging Service Center (MMSC) provides a capability to store and forward messages that include multimedia content such as images, audio, video, as well as text.

[8] 4G refers to the fourth generation of wireless technologies such as Long Term Evolution and mobile WiMAX that provide high speed data services to the end users.

Priority and Quality of Service (QoS)

While Wireless SMS and MMS provide an alternate means of communications, it should be noted that the commercial carriers currently do not prioritize or even guarantee the delivery of these messages. Under normal circumstances when the networks are not congested, the need for prioritization doesn't usually arise because of the availability of sufficient bandwidth in the network. However, in emergency situations when the networks are congested, as in the recent East Coast earth quake, priority and quality of service will be required for the reliable and timely delivery of these messages to the PSAPs.

Northrop Grumman urges the Commission to work with Public Safety and the commercial carriers to establish a framework for ensuring the prioritization and quality of service of the SMS and MMS messages that are originated by the public during emergency incidences. A similar framework known as Wireless Priority Service (WPS)[9] is already in place for voice-based emergency communications.

Standards-based Framework

Northrop Grumman supports the Commission's consideration for a SIP-based approach to integrating all components of the NG9-1-1 network. The standard's approach to establishing the core and non-core elements of the NG9-1-1 network will ensure uniform performance across different software and hardware solutions that will ultimately be deployed to support its implementation.

The use of IP technology in both wireless and fixed line telecommunications employing industry standards protocol for networking and device applications will enable the realization of advanced capabilities of NG9-1-1 in the near and long terms. The current evolution of wireless transport network such as the emerging public safety broadband network and upgrades of commercial wireless carrier networks to 4G[10] wireless technologies such as Long Term Evolution (LTE) will further enhance NG9-1-1 capabilities. However, the non-uniform

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[9] Wireless Priority Service (WPS) is a priority calling capability offered by the commercial wireless carriers to personnel at the Federal, State, and local levels that greatly increases the probability of call completion during a national security and emergency preparedness (NS/EP) event when wireless networks are experiencing congestion due to increased call volume
[10] Long Term Evolution is a fourth generation broadband wireless technology standard that is currently being deployed by the major wireless carriers to upgrade their networks

deployment of these broadband data transport capabilities across the nation only implies that connectivity to the PSAPs using these multimedia devices from various wireless provider coverage areas will be spotty initially, giving rise to a non-uniform coverage of NG9-1-1 capabilities. Thus, the inclusion of IP Multimedia Subsystem (IMS), which is the next generation platform for integrating voice, video, and data applications in the IP networks, will promote interoperability between the legacy and next generation networks.

Thus to achieve interoperability across the end-to-end NG9-1-1 system, Northrop Grumman recommends the adoption of standards-based framework for all the protocols and systems to enable rapid adoption across all jurisdictions and mitigate operational risks.

III.   **OPERATIONAL CHALLENGES**

There are many challenges associated with the operations of a NG9-1-1 system that include:

- Keeping operational policies, procedures, education, and training in synch with the speed of technology development and adoption of new technologies.
- Developing robust security policies and procedures for the IP based NG9-1-1 to protect the system from insider cyber threats and external cyber attacks.
- Ensuring the system has adequate bandwidth, in terms of both network and human resources, to handle the flow of information that is likely to increase significantly as NG9-1-1 introduces new communications capabilities such as video, text messaging and enhanced data services to the public. This is particularly important during emergency incidents when the emergency networks can get easily overwhelmed with traffic. The legacy voice-centric traffic and bandwidth estimation methods may no longer be applicable to the IP based NG9-1-1 network and new tools and methods may need to be developed.
- Developing new tools, policies, and procedures to analyze and process the data received by the PSAPS in different formats over various communication media. Ensure the information is processed quickly and correctly to meet public expectation for increased reliability .and improved response times.

- Maintaining compatibility with the legacy 9-1-1 systems while migrating to the new NG9-1-1 systems.
- Providing assistance, research and other input to PSAPs dealing with emerging communications services.
- Focusing on needs of people with disabilities
- Developing educational materials and programs for all parties involved – PSAP and the public

Information Analytics

A key objective of the NG9-1-1 systems is to leverage the advances in next generation communication technologies to enable the public to send emergency communications to 9-1-1 Public Safety Answering Points (PSAPs) via different media such as text, photos, videos, and data and enhance the information available to PSAPs and first responders for assessing and responding to emergencies. This also satisfies public demand for the ability to communicate with emergency services using both voice and non-voice means of communications from anywhere and using any device. However, this also means that large volumes of data arriving at the PSAPS in various formats must be processed quickly in order to extract the relevant critical and actionable pieces of information which will then be delivered to the telecommunicators and computer aided dispatch systems to effectively and efficiently respond to emergencies. The ability to fuse and correlate data from multiple sources of information including audio, video, text, and various databases to create a holistic operational view and a common operating picture will be critical in meeting the key objectives of the NG9-1-1 systems to better assess the nature of emergencies, identifying and locating the right resources to respond, and improving the overall response time.

Northrop Grumman is at the forefront of developing and deploying cutting-edge technologies and applications for information analytics that are being successfully used at many of our government customer sites. We also support the management and operation of data fusion centers for the Department of Homeland Security and for the State fusion Centers throughout the US. As PSAPs collect, analyze and store high value information in their databases, sharing of information between the PSAPs and various federal, state, and local agencies gains even more

significance in mounting an effective and coordinated emergency response as well as combating crime and thwarting terrorists.

Northrop Grumman urges the Commission to support the development of national standards as well as a regulatory and policy framework for storing, securing and sharing this information.

Security

The reliability of NG9-1-1 systems is vital to the critical mission of saving lives and protecting property. NG9-1-1 systems need to be secured and safeguarded with the same heightened level of importance as any other critical infrastructure. As is well known, malicious attacks on our critical information and communication networks, also known as cyber attacks have increased significantly in the past few years and they continue to grow in scope, complexity, and sophistication. The need for increased cyber vigilance has never been greater.

Northrop Grumman concurs with the Commission's view that adopting new IP based communications technologies and empowering citizens to communicate with the NG9-1-1 systems using multiple means of communications improves the quality and effectiveness of emergency response. However, use of commercial-off-the-shelf-technologies that use Internet Protocol to increased network connectivity and interoperability, also increases the vulnerability of the NG9-1-1 systems to externally mounted attacks. The ability to accept data, text, images, and video from the public carries vulnerabilities for network intrusion, malware infection, and malicious viruses.

A large scale denial of service attack on the NG9-1-1 system, just when it is needed most, could have a crippling effect on the mission of our first responders. These systems need to be strongly safeguarded and proactively monitored to avert casual as well as advanced persistent threats. Sophisticated security tools including Intrusion Protection and Detection systems and anti-virus software will be needed to continuously monitor the incoming traffic for malicious content such as malware and computer viruses, and isolating such traffic from the system to prevent harm. Sophisticated tools and algorithms will be needed to distinguish prank calls from genuine emergency calls to prevent the misuse of valuable resources.

The amount of information available to NG9-1-1 PSAPs will be much greater than the current PSAPs and more of it will be housed in shared network databases. This has implications on user privacy and will need a careful and thorough review of federal and state privacy laws.

Northrop Grumman recommends that the Commission take notice of the security aspects of the NG9-1-1 systems and help increase the awareness of this issue to support the development of standards, policies and procedures for securing the NG9-1-1 systems.

IV.   CULTURAL IMPLICATIONS

NG9-1-1 functionality imposes some cultural challenges to PSAPs in the form of training requirements and the imposition of added stress in an already stressful occupation. Along with text messages comes an entirely new skill set, the ability to understand and comprehend the message. Secondly, as pictures and video stream into the PSAP, telecommunicators who are unprepared to view graphic images may suffer undue stress as a result.

With respect to text messaging, learning and maintaining a fluent understanding of the "texting language" (the abundant use of acronyms and emoticons) will force PSAPs to deploy text message curricula. A challenge in itself, initial training must be followed by regular and frequent updates given the fast pace of text language evolution. PSAPs will, necessarily, need to keep pace with speed of evolution in "teen age" communications. Younger telecommunicators may have no problems as they are immersed in the texting culture along with their age peers. Older telecommunicators may have difficulty grasping and maintaining proficiency.

Modern PSAPs are equipped with "stress rooms" or relaxation areas for telecommunicators to get off-line and de-stress following a difficult call. The issue of telecommunicator stress has caused many PSAP organizations to offer a Critical Incident Stress Debriefing programs. It is common in many PSAPs that telecommunicators are also public safety practitioners. They are either uniform members of the agencies they serve, or they are volunteer firefighters or medical personnel. But for those who are complete "civilians," working in the sterile environment of a PSAP will not prepare them to view graphic and disturbing images of trauma and death. With images and video comes a major amplification in human resource and personnel management challenges.

Concerns over confidentiality exist relative to persons included in video and images that are sent to PSAPs that depict incidents requiring emergency services involvement. Rules will be required that address privacy concerns of individuals who happen to be in the proximity of an emergency, are included in the frame of a photograph, but have not consented to having their picture perused by telecommunicators. Moreover, rules regarding the release of NG9-1-1 data to the public will be necessary to safeguard privacy and protect the PSAP against liability.

Legislators need to be aware that rules for NG9-1-1 will be necessary to affix a publically expected level of value to NG9-1-1 data and the reconciliation of interpretation between what the senders believes they see and what is visible to the receiving telecommunicators. In other words, what is the level of expected liability when the receiving telecommunicator does not see in a transmitted photograph what the picture taker believes they see?

Northrop Grumman recommends that the Commission consider the cultural aspects of NG9-1-1 functionality and includes discussion of these issues in its rule making process. Programs to deal with the training burden of text messaging and the potential for added stress from viewing graphic images need to be additions to any PSAP NG9-1-1 policies and procedures. Governments need to be aware that NG9-1-1 will bring questions of responsibility and liability to the PSAP enterprise.

V.   **CONCLUDING REMARKS**

Significant issues are involved in the implementation and use of NG9-1-1 functionality. Beyond the technical challenges, there are operational and cultural ramifications of implementing IP based functionality in a traditionally switch-based environment. The key message to be taken from this discussion is that superbly executed preparation is paramount to the successful implementation of NG9-1-1.

From the technical perspective, networks need to be upgraded to accept and manage enhanced modes of information transfer. To that end, we recommended adoption of the SIP based protocol in the NG9-1-1 technical architecture. The source of that information is also important as each text, picture, video or data set needs to be associated with an incident. SMS and MMS quality and prioritization should be achieved through WPS, similar to what exists in

voice-based emergency communications systems. Including IMS into the platform will provide a uniform standard and promote interoperability between legacy and next generation networks.

The operational challenges are abundant. There have been no empirical studies to determine the effect on telecommunicator workload that NG9-1-1 capabilities will impose. This will be most relevant in small to medium PSAPs or anywhere calls for service are received, processed, dispatched and managed by the same console position. Threats to continuity of operations brought on by cyber attacks are extremely important considerations. Robust security practices and technologies are necessary to mitigate that threat to its lowest possible potential. New functionality will require cogent policies and procedures to effectively manage the addition of a wider spectrum of incoming information. Finally, just as training telecommunicators to deal with NG9-1-1 functionality is necessary, public education will be required to manage the public's expectation of what NG9-1-1 will do for them and how to appropriately use the technology. This also speaks to information analytics as procedures for the acceptance, use and storage of NG9-1-1 data evolves with the technology.

NG9-1-1 functionality, particularly SMS and MMS has a certain culture associated with a modern and contemporary lifestyle, so much so that it has developed its own language. The first challenge is to distil that language into a transferrable curriculum so that telecommunicators understand the context and meaning of the message, and secondly keeping past with its accelerating evolution. The PSAP community will also face a challenge abrupt and sudden shock of a purely civilian telecommunicator receiving a graphic image of violence and mayhem. The unprepared PSAP will have to deal with a highly distraught employee. Lastly, there needs to be the revelation that any government function or technology carries a certain amount of liability risk. Part of the NG9-1-1 preparation equation is examining and defining where such vulnerabilities exist and crafting legislation to manage that risk.

Adequate governance is vital to developing, maintaining and evolving the rules by which PSAP engages NG9-1-1 functionality. Governance Boards and authoritative bodies that represent PSAP stakeholders and members of the communities they serve develop, promulgate and enforce the rules governing next generation functionality. They establish the stated public expectations of the enhanced services and create policy initiatives that outline what is expected and what will be accepted, how next generation data will be applied to incident management, and to what extent organization change is required to manage the added workload. "At a minimum,

the implementation strategy must address the following components: legislative changes, regulatory limitations, governance issues, state-level coordination, funding, state-wide and local infrastructure needs, operational impact, confidentiality, and liability."[11]

As a stakeholder in critical infrastructure protection, public safety and homeland security, Northrop Grumman is pleased to provide these comments to the Federal Communications Commission. A partner in mission critical enterprises, we stand ready to continue our support.

Respectfully submitted,

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[11] Next Generation 9-1-1 – Strategic Initiative Charter, Commonwealth of Virginia, September 22, 2011